Saskatchewan
Research Council

SASKATOON SRC

CLIMATOLOGICAL REFERENCE STATION

ANNUAL SUMMARY, 1991

by

V. Wittrock
and
E.E. Wheaton

SRC Technical Report No. 233

Publication **E-2900-1-B-92** **January, 1992**

SASKATOON SRC

CLIMATOLOGICAL REFERENCE STATION

ANNUAL SUMMARY, 1991

by

V. Wittrock
and
E.E. Wheaton

SRC Technical Report No. 233

SRC Publication No. E-2900-1-B-92

January, 1992

92-07436/

ACKNOWLEDGEMENTS

The Saskatchewan Research Council (SRC) gratefully acknowledges the financial support of the Atmospheric Environment Service, Environment Canada, which supports in part the operations of the benchmark station through a contractual agreement.

The observing program owes much to the careful work of V. Wittrock, R. Begrand, R. Jahren, R. MacPherson, J. Matamala, B. Smith, D. Bedard and C. Beaulieu.

Discussions with the staff of the Saskatoon Weather Office and K. Leek and J. Mravnik, Atmospheric Environment Service site inspection officer, have proven most helpful.

Technical drafting for this report was undertaken by Graphic Services, SRC.

Y. Wilkinson, SRC, and Mary Ann Bisson provided the word processing for this report.

Enquiries concerning the Climatological Reference Station data and its measurement programs are welcome. For further information, please contact:

V. Wittrock, Research Scientist, Environment Technology Division, or

E.E. Wheaton, Lead Scientist, Environment Technology Division.

ABSTRACT

Data concerning temperature, precipitation, soil temperature, evaporation, wind speed, bright sunshine and solar radiation at the Saskatoon Climatological Reference Station (52°09'N, 106°36'W, 497 m MSL) are presented for the year 1991 and compared with the long term historic and standard period (1961-1990) records (Table 1).

1991 was an extremely wet year. A new record for total annual precipitation over the entire period of record was set in 1991. In fact, the total annual precipitation for Saskatoon CRS at 546.9 mm exceeded the previous record of 533 mm set in 1942. The majority of the precipitation came as rainfall (437.8 mm) with the rest being snowfall (actually 0.6 cm below the normal yearly amount).

The mean annual temperature was above normal by 1.2°C. Only three years in the last 30 years had higher mean annual temperatures, and all of these were during the 1980s (1988, 1987, and 1981). The mean minimum temperature was 1.4°C above normal; only four years in the last 30 years had higher mean minimum temperatures.

There were also daily record temperatures set throughout 1991. January 21, 1991 recorded a record high temperature of 5°C; April 1 also recorded a record high of 22°C and October 30 and November 5 recorded record lows (-21°C and -23°C respectively).

Nine months during 1991 recorded above normal mean temperatures and seven months had above normal precipitation, while four months (February, April, May and June) had both. The extreme maximum temperature recorded was in August when 36.0°C was attained and the extreme minimum temperature was recorded in January at -37.5°C.

The greatest 24-hour precipitation (42.0 mm rainfall) fell in June. The greatest 24-hour snowfall was in October with an accumulation of 14.6 cm. Both of these extremes were well below the record extremes.

This year's evaporation amount of 1021.9 mm was the eighth highest in the last 30 years and 33.6 mm above normal. The number of days with frost was six less than normal. The peak wind speed of 108 km/hr was recorded in May. The mean wind speed for the year was close to normal.

A below normal amount of bright sunshine was recorded for 1991. This is reflected in the lower than normal total global radiation and the above normal total diffuse radiation.

As Saskatoon has a continental climate precipitation amounts can go to extremes over relatively short time intervals. It was just four years ago in 1987 when Saskatoon received just 232.4 mm total annual precipitation. Compared to this year's precipitation, 1987's amount was a "drop in the bucket."

1991 was an exceptional year for farmers in the Saskatoon area and across most of western Canada. The farmers in the area received record yields for most of their crops. The City of Saskatoon's revenues however, may have been negatively affected by all the precipitation received during the summer. This record setting precipitation resulted in the public not using as much water for their lawns and gardens in the summer which produced less revenue for the City (Klein 1992).

TABLE OF CONTENTS

page

ACKNOWLEDGEMENTS i
ABSTRACT ii
TABLE OF CONTENTS iv
HISTORY AND STATION LOCATION 1
FOOTNOTES TO CLIMATIC TABLES 1 TO 13 3
REFERENCES 31

LIST OF TABLES

page

Table 1 Annual Climatic Summary, Saskatoon SRC, 1991 7
Table 2 Monthly Weather Summary for January, 1991 8
Table 3 Monthly Weather Summary for February, 1991 9
Table 4 Monthly Weather Summary for March, 1991 10
Table 5 Monthly Weather Summary for April, 1991 11
Table 6 Monthly Weather Summary for May, 1991 12
Table 7 Monthly Weather Summary for June, 1991 13
Table 8 Monthly Weather Summary for July, 1991 14
Table 9 Monthly Weather Summary for August, 1991 15
Table 10 Monthly Weather Summary for September, 1991 16
Table 11 Monthly Weather Summary for October, 1991 17
Table 12 Monthly Weather Summary for November, 1991 19
Table 13 Monthly Weather Summary for December, 1991 20
Table 14 Soil Temperature and Snow Cover at Saskatoon SRC, January 1991 . . . 21
Table 15 Soil Temperature and Snow Cover at Saskatoon SRC, February 1991 . . 21
Table 16 Soil Temperature and Snow Cover at Saskatoon SRC, March 1991 21

page

Table 17 Soil Temperature and Snow Cover at Saskatoon SRC, April 1991 22
Table 18 Soil Temperature and Snow Cover at Saskatoon SRC, May 1991 22
Table 19 Soil Temperature and Snow Cover at Saskatoon SRC, June 1991 22
Table 20 Soil Temperature and Snow Cover at Saskatoon SRC, July 1991 23
Table 21 Soil Temperature and Snow Cover at Saskatoon SRC, August 1991 23
Table 22 Soil Temperature and Snow Cover at Saskatoon SRC, September 1991 . 23
Table 23 Soil Temperature and Snow Cover at Saskatoon SRC, October 1991 . . . 24
Table 24 Soil Temperature and Snow Cover at Saskatoon SRC, November 1991 . 24
Table 25 Soil Temperature and Snow Cover at Saskatoon SRC, December 1991 . . 24
Table 26 Diffuse Solar Radiation (MJm^{-2}) at Saskatoon SRC, 1991 25
Table 27 Global Solar Radiation (MJm^{-2}) at Saskatoon SRC, 1991 26
Table 28 Some Significant Climatic Events, 1991 27
Table 29 Times of Sunrise at Saskatoon, 1991 (local time, in hours and minutes). . 28
Table 30 Times of Sunset at Saskatoon, 1991 (local time, in hours and minutes). . 29

LIST OF FIGURES

page

Figure 1. Year 1991 Daily Temperature and Cumulative Precipitation 30

HISTORY AND STATION LOCATION

The first meteorological observations appear to have been taken at or near Saskatoon by the Royal Northwest Mounted Police in 1889. At first only temperatures were recorded. A number of changes were made in the coordinates and as a result there is some disagreement in the early records as to the exact location of the weather observing point. The bulk of the evidence, however, indicates that the location was 52°15'N and 106°20'W, elevation 480 m above sea level. This would place it at Clark's Crossing, on the South Saskatchewan River, approximately 16 km north and east of the centre of the present City of Saskatoon. At that time there was a settlement at Clark's Crossing and also about 10 or 15 families on either side of the river at Saskatoon.

Little is known about the early observers. However, the records show that a Major T.H. Keenan took the observations from March, 1892 until March, 1895. Mr. George Will was the observer from January, 1897 until April, 1897. It is thought that Thomas H. Copeland was involved in the observational program from 1895 to May 1, 1901, at which time it was taken over by Mr. Eby, senior. Continuous observations were taken by the Eby's at a site on 8th Street until October 31, 1942, when the station was closed. Mr. Eby continued the program until his death in 1921. His daughter, Miss E.S. Eby, recorded the observations until April, 1931 and was replaced by her brother, J.M. Eby, who continued the program until the station was closed. The Eby station recorded temperature, precipitation and weather notes on fog, thunderstorms, winds and any unusual weather phenomena. Reports were made twice daily, morning and evening.

In 1916 a climatological station was established by the Physics Department of the University of Saskatchewan and continuous observations were kept twice daily until January 15, 1965. The long time observer at this site was Mr. Sidney Cox. The Saskatchewan Research Council took over the program in the fall of 1963 at our newly established Climatological Reference Station.

The location of the Saskatchewan Research Council's Climatological Reference Station is latitude 52°09'N and longitude 106°36'W and the elevation is 497 m above mean

sea level[1]. The long time observer (16 years) at this present site was Mr. Joe Calvert, who retired from the program in August, 1983.

Then Mr. Ray Begrand succeeded Mr. Calvert until September, 1988 when Ms. Virginia Wittrock became the primary observer. The observers for 1991 were Virginia Wittrock, Ray Begrand, Rolf Jahren, Bob MacPherson, Julio Matamala, Brett Smith, and Dave Bedard.

---

[1] From various sources including the Physical Environment of Saskatoon, Canada (E.A. Christiansen (ed.) 1970) and 1974 Annual Meteorological Summary, Saskatoon, Saskatchewan, (Environment Canada, Atmospheric Environment Service).

FOOTNOTES TO CLIMATIC TABLES 1 TO 13

1. The annual values (Table 1) are calculated using the monthly summaries, January to December, 1991 (Tables 2 to 13).

2. In climatology it is often useful to make spatial comparisons of particular element values over a common time period. At an interior continental site such as Saskatoon, a period of 30 years is required to produce statistically stable estimates of the more variable elements. To facilitate spatial comparisons, the World Meteorological Organization recommends the standard normal period January 1, 1961 to December 31, 1990 for data analysis. Items in this column conform to this standard, except where noted.

3. Temporal comparisons at a point are also of value in some types of climatic studies. Therefore, it is desirable to produce the maximum length of reliable climatic record to carry out studies over a period of time. Data in this column are drawn from the following data sets:

Saskatoon SRC	1963 to 1991
Saskatoon U. of S.	1916 to 1963
Saskatoon	1892 to 1915

   Station locations, exposures and measurement procedures were subject to change during this time period. Data presented in this column are unadjusted and users are cautioned accordingly.

4. The mean annual temperature is defined as the average of the daily mean temperatures for one year. In the monthly summaries (Tables 2 to 13) the daily mean temperature reported is the average of the daily mean temperatures for the one month under consideration. In turn, the daily mean temperature for a particular day is defined as the arithmetic mean of the daily maximum temperature and the daily minimum temperature for the date.

5. The mean maximum temperature tabulated is the mean of the daily maximum temperatures for one year in the case of Table 1 and for particular months in the cases of Tables 2 to 13. For details concerning measurement procedures, the reader is referred to the Atmospheric Environment Service publication Manual of Climatological Observations, second edition, January, 1978.

6. The mean minimum temperature as tabulated is defined as the mean of the daily minimum temperatures averaged over the appropriate time periods. Refer to note 5 above concerning measurement procedures.

7. The word "extreme" refers to the highest or lowest value of a particular element recorded during the period in question. The highest temperature recorded at Saskatoon SRC during 1991 was 36.0°C, while the highest value ever recorded was 41.0°C (June, 1988).

8. A day with frost is recorded on each occasion when the daily minimum temperature is equal to or less than 0°C.

9. A heating degree-day (HDD) is an index of the heating requirement to achieve a stipulated comfort value in an indoor environment. For most purposes, a temperature of less than 18°C is considered uncomfortable and supplementary heating is required. On a specific day, the amount by which 18°C exceeds the daily mean temperature defines the number of heating degree-days for that day. Mathematically:

$$HDD = (18°C - T), \text{ for that day,}$$

where T = daily mean temperature in °C
if T is equal to or greater than 18°C, HDD = 0.

Monthly and annual values of HDD are obtained by summing daily values.

10. In order for plant growth to proceed, air temperature must exceed a critical value appropriate to the plant species in question. For many members of the grass family, including most commercial cereals grown on the prairies, a base temperature of 5.0°C has been established. On a specified day, the difference between the daily mean temperature and the 5.0°C base temperature defines the number of growing degree-days (GDD). Mathematically:

$$GDD = (T - 5.0°C), \text{ for that day,}$$

where T = daily mean temperature in °C
if T is equal to or less than 5.0°C, GDD = 0.

Daily GDD values are summed to provide totals for the appropriate month, growing season or year.

11. Total precipitation is the sum of the daily rainfall and daily snowfall amounts recorded. The snowfall component of precipitation is recorded as an equivalent amount of liquid water. For particulars on precipitation measurement procedures and instruments, the reader is referred to the Atmospheric Environment Service publication Manual of Climatological Observations, second edition, January, 1978. The notation T in this column refers to a trace of precipitation (less than 0.2 mm water equivalent).

12. Note that prior to 1960, measurement of snowfall was accomplished using snow rulers set vertically in the ground to obtain the thickness of the newly deposited layer. In obtaining precipitation values a standard water equivalent of one inch of snow yielding one-tenth inch of water was assumed. Since these measurements were inaccurate due to snow drifting, compaction and varying water equivalent, the Nipher snow gauge which actually catches snow has been employed at a number of stations (including Saskatoon SRC, Climatological Reference Station) in more recent years.

13. A precipitation day is recorded on occasions when the amount of precipitation in a 24-hour period equals or exceeds 0.2 mm water (0.01 inch in English units). If both rain and snow occur on the same day, a snow day, a rain day and a precipitation day are all recorded. If only one form of precipitation occurs on a specified date, a precipitation day, a rain day or a snow day are recorded appropriately. Beginning in 1974, observations at Saskatoon SRC refer to the calendar day. Previous to 1974, the so-called climatological day, beginning at 9 a.m. standard time on the date of reference and ending at 9 a.m. the next morning, was employed in record-keeping. An asterisk (*) appearing in the normal column denotes the occurrence of measurable precipitation on one or more occasions, and that the calculated 30-year mean amounts to less than a trace.

14. Evaporation measurements are carried out in the period May 1 to October 31 (weather permitting) only, using the International Hydrological Decade class A pan. The data reported is the sum of the daily net evaporation. Particulars of the measurement procedure are contained in the Atmospheric Environment Service publication "Evaporation", May, 1978. The data base available for comparison is the Saskatoon SRC record for the period 1964 to 1990. The notation M refers to missing data.

15. The mean wind speed value reported is the mean of the hourly wind speeds for the period in question. Average hourly wind speeds are obtained from recording instruments. The anemometer employed is a propeller-type aerofoil at a height of 10 m.

16. Peak gust refers to the highest instantaneous value recorded by the anemometer system for the period of reference, irrespective of direction and/or duration. Comparison is again with published data for Saskatoon Airport.

17. Total bright sunshine is the sum of the daily bright sunshine values in hours and tenths of hours as recorded by a Campbell-Stokes sunshine recorder. Atmospheric Environment Service publication, "Bright Sunshine, 1951-1980", Volume 7 supplies information on measurement procedures.

18. Percent possible bright sunshine hours refers to the ratio of measured bright sunshine hours to total possible daylight hours in a given period, expressed as a percentage.

19. Total global solar radiation is the sum of the daily values of short wave solar radiation recorded during the period in question (Tables 1 and 27). Measurements are carried out on a horizontal surface at the ground and integrated over the whole celestial dome, summing the diffuse and direct components of the solar beam. The measuring instrument is a temperature-compensated Eppley pyranometer. The standard metric unit of measurement is the megajoule per square metre (MJ m^{-2}). (To facilitate comparison with past years' data: 1.0 MJ m^{-2} = 23.895 langleys). Comparison is provided with a provisional normal based on sixteen years of data (1975-1990). Diffuse solar radiation is also recorded (Tables 1 and 26). The instrument used is an Eppley pyranometer with a shade ring.

20. The year/day entry appearing in Tables 2 to 13 refers to the year and day on which an extreme event occurred. Reference to the month appears in the table heading. For example, referring to Table 2, the warmest days in January, 1991 were the 18th and 21st with a high temperature of 4.5°C, while the warmest January day on record was January 30, 1931 with a high temperature of 10.0°C.

21. Due to missing observations, faulty instrument calibration, lost records, etc., only partial data are available especially during the period 1892 to 1915. The number of years of useful record is therefore cited.

22. Soil temperature, under a short grass surface with normal snow accumulation, is measured according to procedures outlined in the Atmospheric Environment Service publication "Soil Temperature", January 1, 1976. Depths below surface at which soil temperature measurements are made are: 5 cm, 10 cm, 20 cm, 50 cm, 100 cm, 150 cm and 300 cm. Since soil temperature is affected by profile structure and water content, extrapolation of the measured data is difficult.

Table 1. Annual Climatic Summary, Saskatoon SRC, 1991

	1991[1] Values	1990 Values	Normals[2] (1961-90) and Extremes[3] (1892-1991)
Mean Annual Temperature[4] (°C)	3.2	2.5	2.0
Mean Maximum Temperature[5] (°C)	8.9	8.7	7.8
Mean Minimum Temperature[6] (°C)	-2.4	-3.5	-3.8
Extreme Maximum Temperature[7] (°C)	36.0 (Aug.)	35.0 (Aug.)	41.0 (June)
Extreme Minimum Temperature[7] (°C)	-37.5 (Jan.)	-39.0 (Dec.)	-50.0 (Feb.)
Days with Frost[8]	192	200	198
Heating Degree-Days[9] (18°C base)	5562.5	5679.0	5684
Growing Degree-Days[10] (5°C)	1788.1	1658.5	1660
Total Precipitation[11] (mm)	546.9	310.3	361.4
Total Rainfall[11] (mm)	437.8	215.0	250.7
Total Snowfall[12] (cm)	109.1	95.3	109.7
Greatest 24-hr Precipitation (mm)	42.0 (June)	23.0 (July)	99.4 (June)
Greatest 24-hr Rainfall (mm)	42.0 (June)	23.0 (July)	99.4 (June)
Greatest 24-hr Snowfall (cm)	14.6 (Oct.)	11.4 (Nov.)	36.7 (Oct.)
Precipitation Days[13]	125	96	114.0
Rainfall Days[13]	73	55	62
Snowfall Days[13]	53	46	56
Total Evaporation[14] (mm)	1021.9 (May-Sept.)	986.3 (May-Sept.)	988.3 (May-Sept.)
Mean Wind Speed[15] (km/hr)	15.9	16	16.3
Peak Wind Gust[16] (km/hr)	108 (May)	100 (June)	151 (Aug.)[a]
Total Bright Sunshine[17] (hr)	2263.4	2302.4	2399.3
Total Global Radiation[19] (MJ m^{-2})	4266.1	4191.3	4322.0
Total Diffuse Radiation[19] (MJ m^{-2})	1761.0	1749.4	1729.5

[a] information from Saskatoon Airport

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 2 **MONTHLY WEATHER SUMMARY FOR JANUARY, 1991**

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	-17.1	-12.0	-17.6	
Monthly Mean Maximum Temperature[5] (°C)	-11.6	-6.9	-12.4	
Monthly Mean Minimum Temperature[6] (°C)	-22.6	-17.0	-22.7	
Extreme Maximum Temperature[7] (°C)	4.5	4.0	7.0	10.0
Year/Day(s)[20]	1991/18&21	1990/7	1986/11	1931/30
Years of Record[21]	1	1	27	93
Extreme Minimum Temperature[7] (°C)	-37.5	-36.0	-43.9	-48.9
Year/Day(s)[20]	1991/8	1990/30	1966/22&1969/29	1893/31
Years of Record[21]	1	1	27	93
Days with Frost[8]	31	31	31	
Heating Degree-Days[9] (18°C base)	1085.0	921.0	1043.0	
Growing Degree-Days[10] (5°C base)	0.0	0.0	0.0	
Total Precipitation[11] (mm)	7.1	18.7	20.8	
Total Rainfall[11] (mm)	0.0	1.1	0.4	
Total Snowfall[12] (cm)	7.1	17.6	20.0	
Greatest 24-hour Precipitation (mm)	1.8	5.8	15.4	30.5
Year/Day(s)[20]	1991/25&26	1990/16	1989/30	1893/23
Years of Record[21]	1	1	27	93
Greatest 24-hour Rainfall (mm)	0.0	1.1	2.4	2.4
Year/Day(s)[20]	--	1990/7	1989/30	1989/30
Years of Record[21]	1	1	27	93
Greatest 24-hour Snowfall (cm)	1.8	5.8	13.0	30.5
Year/Day(s)[20]	1991/25&26	1990/16	1989/30	1893/23
Years of Record[21]	1	1	27	93
Precipitation Days[13]	11	11	11	
Rainfall Days[13]	0	1	*	
Snowfall Days[13]	11	10	11	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	13.7	17.0	15.7	
Peak Gust Speed[16] (km/hr)	67.8	98.5	111.0	
Total Bright Sunshine[17] (hr)	115.4	83.7	104.9	
Percent Possible Bright Sunshine[18]	45	33	41	
Total Global Radiation[19] (MJ m^{-2})	129.1	111.3	129.9	
Total Diffuse Radiation[19] (MJ m^{-2})	73.8	75.2	71.4	
Mean Soil Temperature[22] (°C) (10,50 cm)	-11.1, -5.4	-5.7, -1.8	-8.3, -3.9	
Mean Soil Temperature[22] (°C) (150,300 cm)	1.4, 4.5	2.3, 4.8	1.8, 4.4	

SUMMARY:

January, 1991 continued the cold temperature spell that began in December, 1990. Normal temperatures were not reached until the 12th. Even though it was cold at the beginning of the month, the overall monthly mean temperature was 0.5° above normal. The "January thaw" appeared on schedule with four days having above freezing temperatures. The highest temperature of 4.5°C was recorded on the 18th and 21st. The lowest temperature of -37.5°C was recorded on the 8th. January thaws are often followed by a cold spell. The second more pronounced thaw was followed by days with low minimum temperatures. The high number of heating degree days was a result of these cold spells. January was a very dry month with only 34% of normal precipitation. Most of which came after the temperatures warmed up. The largest snowfall amount occurred twice - 1.8 cm fell on the 25th and on the 26th. An above normal amount of bright sunshine and a near normal amount of total global radiation were recorded. The majority of the continuously sunny days occurred during the start of January with the cold spell. The soil temperatures were all below normal, with the exception of the 300 cm depth.

Did you know that ice is much more slippery near its freezing point than at lower temperatures? Motorists need twice the braking distance to stop on ice at -1°C than at -18°C (Phillips 1987).

Table 3

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl
MONTHLY WEATHER SUMMARY FOR
FEBRUARY, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	-6.7	-13.6	-13.8	
Monthly Mean Maximum Temperature[5] (°C)	-1.6	-7.6	-9.0	
Monthly Mean Minimum Temperature[6] (°C)	-11.7	-19.6	-18.3	
Extreme Maximum Temperature[7] (°C)	7.5	4.0	7.5	12.8
Year/Day(s)[20]	1991/6	1990/22	1988/26	1931/19
Years of Record[21]	1	1	27	95
Extreme Minimum Temperature[7] (°C)	-26.0	-38.0	-41.1	-50.0
Year/Day(s)[20]	1991/14	1990/1	1972/6	1893/1
Years of Record[21]	1	1	27	95
Days with Frost[8]	25	28	28	
Heating Degree-Days[9] (18°C base)	679.0	882.0	878.0	
Growing Degree-Days[10] (5°C base)	0.0	0.0	0.0	
Total Precipitation[11] (mm)	15.6	7.9	14.5	
Total Rainfall[11] (mm)	0.0	0.0	0.2	
Total Snowfall[12] (cm)	15.6	7.9	14.3	
Greatest 24-hour Precipitation (mm)	3.0	2.4	14.2	20.3
Year/Day(s)[20]	1991/12	1990/16	1979/13	1918/7
Years of Record[21]	1	1	27	95
Greatest 24-hour Rainfall (mm)	0.0	0.0	1.8	8.1
Year/Day(s)[20]	--	--	1968/26	1953/3
Years of Record[21]	1	1	27	95
Greatest 24-hour Snowfall (cm)	3.0	2.4	14.2	20.3
Year/Day(s)[20]	1991/12	1990/16	1979/13	1918/7
Years of Record[21]	1	1	27	95
Precipitation Days[13]	10	6	10	
Rainfall Days[13]	0	0	*	
Snowfall Days[13]	10	6	9	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	14.2	21*	15.8	
Peak Gust Speed[16] (km/hr)	69	74	106	
Total Bright Sunshine[17] (hr)	99.4	153.3	133.2	
Percent Possible Bright Sunshine[18]	36.3	55.9	48.6	
Total Global Radiation[19] (MJ m^{-2})	185.8	225.2	210.1	
Total Diffuse Radiation[19] (MJ m^{-2})	112.2	101.8	105.3	
Mean Soil Temperature[22] (°C) (10,50 cm)	-3.9, -1.7	-8.4, -4.0	-7.3, -4.1	
Mean Soil Temperature[22] (°C) (150,300 cm)	1.0, 2.9	1.1, 3.5	0.8, 3.2	

* 1 day missing data

SUMMARY:

February, 1991 was a warm month with above normal precipitation. The monthly mean temperature was even 0.4°C higher than the mean March temperature. Twenty-two of the 28 days had above normal mean temperatures. The extreme maximum equalled the 1961-1990 extreme of 7.5°C. The warmth was reflected in the number of heating degree days with 199 fewer than normal being recorded. Precipitation was above normal and 7.7 mm more than 1990. The mean wind speed was below normal by 1.6 km/hr. The maximum wind of 69 km/hr was recorded on the 28th. February was a cloudy month with only 36.3% of the total possible amount of sunshine. This cloudiness resulted in below normal global radiation and above normal diffuse radiation. The surface soil temperatures were well above normal for February. The 10 cm soil depth went as high as 2°C. The 5 cm soil depth went to 0°C on the 8th of the month.

February had only 25 days with freezing temperatures. This number broke the previous in 1961-1990 record of 27 days.

Table 4

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl
MONTHLY WEATHER SUMMARY FOR
MARCH, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	-5.4	-2.2	-7.1	
Monthly Mean Maximum Temperature[5] (°C)	0.4	2.2	-2.2	
Monthly Mean Minimum Temperature[6] (°C)	-11.1	-6.5	-12.1	
Extreme Maximum Temperature[7] (°C)	16.5	14.0	15.0	22.8
Year/Day(s)[20]	1991/31	1990/29&30	1973/24&1981/16	1910/23
Years of Record[21]	1	1	27	95
Extreme Minimum Temperature[7] (°C)	-32.5	-18.5	-38.9	-43.3
Year/Day(s)[20]	1991/1	1990/22	1972/2	1897/14
Years of Record[21]	1	1	27	95
Days with Frost[8]	31	25	30	
Heating Degree-Days[9] (18°C base)	724.5	611.5	727.8	
Growing Degree-Days[10] (5°C base)	2.5	5.5	1.5	
Total Precipitation[11] (mm)	11.2	9.4	19.9	
Total Rainfall[11] (mm)	5.4	1.0	1.5	
Total Snowfall[12] (cm)	5.8	8.4	18.8	
Greatest 24-hour Precipitation (mm)	5.4	8.0	32.0	32.0
Year/Day(s)[20]	1991/21	1990/20	1967/30	1967/30
Years of Record[21]	1	1	27	90
Greatest 24-hour Rainfall (mm)	5.4	1.0	5.6	7.4
Year/Day(s)[20]	1991/21	1990/12	1968/3	1938/28
Years of Record[21]	1	1	27	95
Greatest 24-hour Snowfall (cm)	1.8	8.0	32.0	32.0
Year/Day(s)[20]	1991/17	1990/20	1967/30	1967/30
Years of Record[21]	1	1	27	90
Precipitation Days[13]	9	2	9	
Rainfall Days[13]	1	1	1	
Snowfall Days[13]	8	1	8	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	14.7	19.0	16.6	
Peak Gust Speed[16] (km/hr)	64.6	83.0	87	
Total Bright Sunshine[17] (hr)	182.2	184.7	176.9	
Percent Possible Bright Sunshine[18]	49.8	50.5	48.3	
Total Global Radiation[19] (MJ m^{-2})	383.6	349.0	362.4	
Total Diffuse Radiation[19] (MJ m^{-2})	155.4	144.3	173.9	
Mean Soil Temperature[22] (°C) (10,50 cm)	-2.9, -1.0	-0.2, -0.3	-3.1, -1.8	
Mean Soil Temperature[22] (°C) (150,300 cm)	1.1, 2.7	0.6, 2.7	0.4, 2.4	

SUMMARY:

March, 1991 lived up to the saying "in like a lion - out like a lamb." The first of March had the coldest temperatures recorded for the month (-32.5°C) and March 31 recorded the highest temperature (16.5°C). The 16.5°C temperature exceeded the 1961-1990 record and the daily record maximum for the 31st. The mean monthly temperature was 1.7°C above normal. Saskatoon has recorded above normal mean monthly temperatures for the last 3 months. March had 11.2 mm of precipitation, the majority of which was snowfall, but the greatest 24-hour amount was rainfall (5.4 mm). Precipitation for 1991 is 61.4% of normal. The mean wind speed was below normal by 1.9 km/hr. The maximum wind speed of 64.6 km/hr was well below the 1961-1990 extreme of 87.0 km/hr. The total amount of bright sunshine was near normal while the global radiation was 21.2 MJ m^{-2} above normal and total diffuse radiation was 18.5 m^{-2} below normal. All of the soil temperatures were above normal.

March began extremely cold and ended extremely mild. However, the extremes for all years were not reached. On March 23, 1910, an extreme high of 22.8°C was recorded. The extreme low of -43.3°C was recorded on March 14, 1897.

Table 5

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl
MONTHLY WEATHER SUMMARY FOR
APRIL, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	6.3	3.9	3.5	
Monthly Mean Maximum Temperature[5] (°C)	12.6	9.9	9.9	
Monthly Mean Minimum Temperature[6] (°C)	-0.1	-2.2	-2.0	
Extreme Maximum Temperature[7] (°C)	22.0	26.5	30.6	33.0
Year/Day(s)[20]	1991/1	1990/20	1977/26	1952/28
Years of Record[21]	1	1	27	94
Extreme Minimum Temperature[7] (°C)	-4.5	-9.0	-27.8	-28.3
Year/Day(s)[20]	1991/18 & 22	1990/10	1979/1	1893/1954
Years of Record[21]	1	1	27	94
Days with Frost[8]	14	20	20	
Heating Degree-Days[9] (18°C base)	357.5	424.5	388.0	
Growing Degree-Days[10] (5°C base)	55.5	60.0	60.2	
Total Precipitation[11] (mm)	55.8	38.2	20.2	
Total Rainfall[11] (mm)	55.8	21.4	10.4	
Total Snowfall[12] (cm)	T	16.8	9.2	
Greatest 24-hour Precipitation (mm)	23.8	18.4	24.6	30.2
Year/Day(s)[20]	1991/26	1990/24	1985/19	1955/19
Years of Record[21]	1	1	27	94
Greatest 24-hour Rainfall (mm)	23.8	18.4	24.6	26.7
Year/Day(s)[20]	1991/26	1990/24	1985/19	1926/23
Years of Record[21]	1	1	27	94
Greatest 24-hour Snowfall (cm)	T	10.9	18.5	20.3
Year/Day(s)[20]	--	1990/28	1983/10	1942/5
Years of Record[21]	1	1	27	94
Precipitation Days[13]	7	5	7	
Rainfall Days[13]	7	2	4	
Snowfall Days[13]	0	3	4	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	17.9	16.5	17.6	
Peak Gust Speed[16] (km/hr)	67	67	93	
Total Bright Sunshine[17] (hr)	200.3	199.2	231.3	
Percent Possible Bright Sunshine[18]	48	48	56	
Total Global Radiation[19] (MJ m^{-2})	435.2	450.0	492.2	
Total Diffuse Radiation[19] (MJ m^{-2})	167.7	206.0	178.5	
Mean Soil Temperature[22] (°C) (10,50 cm)	5.9, 5.8	4.5, 4.2	3.1, 2.5	
Mean Soil Temperature[22] (°C) (150,300 cm)	3.1, 2.8	2.3, 2.6	1.2, 2.2	

SUMMARY:

April started very mild, the maximum temperature record for the first day of April was broken. The next 12 days had above normal mean daily temperatures. The mean monthly temperature was 2.8°C above normal. The expected trend towards summer conditions was reversed with the maximum being recorded at the start of the month and the minimum at the end of the month. The peculiar month was also reflected in the heating degree days and the growing degree days both of which were below normal. Saskatoon received 35.6 mm more precipitation than normal. Several light showers occurred in the first part of the month, but on the 25th it started to rain in earnest. By month end 55.8 mm of precipitation was received. Total precipitation is now 14.3 mm above normal for the year. The amount of bright sunshine received was nearly the same as last year, while both the global and diffuse radiation were below normal. The warm air temperatures were reflected in the soil temperatures all of which were above normal.

April's precipitation almost equalled the 30 year record (1961-90). 1985 holds the record with 55.9 mm of precipitation. For just rainfall totals, however, April, 1991 exceeded the record during the 1961 to 1990 period. The previous record was in 1985 when 46.8 mm of rain fell.

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 6 **MONTHLY WEATHER SUMMARY FOR MAY, 1991**

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	11.9	10.9	11.5	
Monthly Mean Maximum Temperature[5] (°C)	18.6	17.6	18.5	
Monthly Mean Minimum Temperature[6] (°C)	5.2	4.2	4.5	
Extreme Maximum Temperature[7] (°C)	29.5	27.5	35.0	37.2
Year/Day(s)[20]	1991/20	1990/6 & 29	1988/30	1936/27
Years of Record[21]	1	1	27	94
Extreme Minimum Temperature[7] (°C)	-6.0	-4.0	-10.0	-19.8
Year/Day(s)[20]	1991/2	1990/1, 11 & 13	1967/2	1907/6
Years of Record[21]	1	1	27	94
Days with Frost[8]	7	5	6	
Heating Degree-Days[9] (18°C base)	197.5	227.0	193.1	
Growing Degree-Days[10] (5°C base)	225.5	186.5	209.9	
Total Precipitation[11] (mm)	80.3	39.6	43.9	
Total Rainfall[11] (mm)	73.7	38.9	41.5	
Total Snowfall[12] (cm)	6.6	0.7	2.4	
Greatest 24-hour Precipitation (mm)	25.0	15.8	39.9	51.3
Year/Day(s)[20]	1991/8 & 9	1990/15	1985/4	1909/30
Years of Record[21]	1	1	27	94
Greatest 24-hour Rainfall (mm)	25.0	15.8	39.9	51.3
Year/Day(s)[20]	1991/8 & 9	1990/15	1985/4	1909/30
Years of Record[21]	1	1	27	94
Greatest 24-hour Snowfall (cm)	6.6	0.6	26.2	26.2
Year/Day(s)[20]	1991/1	1990/7	1983/10	1983/10
Years of Record[21]	1	1	27	94
Precipitation Days[13]	10	12	9	
Rainfall Days[13]	9	11	9	
Snowfall Days[13]	1	1	1	
Total Net Evaporation[14] (mm)	189.7[a]	169.5[b]	205.6	
Mean Wind Speed[15] (km/hr)	16.4	16.6	17.6	
Peak Gust Speed[16] (km/hr)	108	88	98	
Total Bright Sunshine[17] (hr)	276.4	250.8	284.6	
Percent Possible Bright Sunshine[18]	56	52	59	
Total Global Radiation[19] (MJ m^{-2})	549.3[b]	543.2	586.3	
Total Diffuse Radiation[19] (MJ m^{-2})	211.4[b]	201.0[c]	222.2	
Mean Soil Temperature[22] (°C) (10,50 cm)	10.6, 9.7	9.7, 8.7	10.5, 8.9	
Mean Soil Temperature[22] (°C) (150,300 cm)	5.8, 4.0	5.0, 3.5	4.4, 3.1	

[a] 2 days missing data [b] 3 days missing data [c] 5 days missing data

SUMMARY:

May, 1991 was a wet warm month. The temperature for May was near normal but the mean minimum temperature was above normal by 0.7 (several warm evenings). Saskatoon and most of Saskatchewan received above normal precipitation. Saskatoon received a total (including snow fall of 6.6 cm) of 80.3 mm precipitation (82.9% above normal). The majority of the rain fell between the 8th and the 13th. Saskatoon has now received 170.0 mm of precipitation since January 1 - a considerable increase over what was received in 1987 (67.8 mm) and 1988 (80.5 mm) for the same period. Saskatoon also received some severe weather including numerous severe thunder storms. The thunder storm that occurred on the 21st generated winds peaking at 108 km/hr. This peak wind speed exceeded the 1961-1990 extreme. The warmer than normal air temperatures created higher than normal growing degree days. The cooler temperatures at the beginning of May (when the extreme low of -6°C occurred) created slightly above normal heating degree days. The total bright sunshine hours were below normal. This is reflected in the lower than normal diffuse and global radiation. Soil temperatures at all four levels were above normal.

Did you know that Saskatoon receives between 20 and 30 thunder storms in a season (Phillips 1986).

Table 7

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl
MONTHLY WEATHER SUMMARY FOR
JUNE, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	16.8	17.0	15.9	
Monthly Mean Maximum Temperature[5] (°C)	22.2	24.0	22.6	
Monthly Mean Minimum Temperature[6] (°C)	11.4	9.9	9.2	
Extreme Maximum Temperature[7] (°C)	29.5	32.0	41.0	41.0
Year/Day(s)[20]	1991/1	1990/26	1988/5	1988/5
Years of Record[22]	1	1	27	95
Extreme Minimum Temperature[7] (°C)	3.5	2.0	-3.3	-3.9
Year/Day(s)[20]	1991/20	1990/3	1967/6	1903/9 & 1917/2
Years of Record[21]	1	1	27	95
Days with Frost[8]	0	0	0	
Heating Degree-Days[9] (18°C base)	56.0	67.0	77.9	
Growing Degree-Days[10] (5°C base)	350.0	353.5	338.8	
Total Precipitation[11] (mm)	160.1	59.6	63.6	
Total Rainfall[11] (mm)	160.1	59.6	63.6	
Total Snowfall[12] (cm)	0	0	0	
Greatest 24-hour Precipitation (mm)	42.0	21.2	99.4	99.4
Year/Day(s)[20]	1991/3	1990/1	1983/24	1983/24
Years of Record[21]	1	1	27	95
Greatest 24-hour Rainfall (mm)	42.0	21.2	99.4	99.4
Year/Day(s)[20]	1991/3	1990/1	1983/24	1983/24
Years of Record[21]	1	1	27	95
Greatest 24-hour Snowfall (cm)	0	0	0	1.8
Year/Day(s)[20]	–	–	–	1938/29
Years of Record[21]	–	–	27	95
Precipitation Days[13]	19	13	12	
Rainfall Days[13]	19	13	12	
Snowfall Days[13]	0	0	0	
Total Net Evaporation[14] (mm)	196.3	219.7	225.1	
Mean Wind Speed[15] (km/hr)	17.3	15.5	17.0	
Peak Gust Speed[16] (km/hr)	89.7	99.8	117	
Total Bright Sunshine[17] (hr)	221.2	309.0	299.3	
Percent Possible Bright Sunshine[18]	44	62	60	
Total Global Radiation[19] (MJ m^{-2})	538.7	611.9[a]	638.7	
Total Diffuse Radiation[19] (MJ m^{-2})	248.6	232.4	228.1	
Mean Soil Temperature[22] (°C) (10,50 cm)	15.9, 14.7	15.7, 14.0	15.7, 14.0	
Mean Soil Temperature[22] (°C) (150,300 cm)	9.5, 6.1	8.2, 5.3	8.3, 5.3	

[a] 1 day missing data

SUMMARY:

June, 1991 was an extremely wet and relatively warm month. Only June, 1942 with 180.3 mm exceeded this month's amount of 160.1 mm of precipitation. However, the January to June, 1991 total precipitation of 330.1 mm is 9% greater than the record amount of 303.5 mm (1942). Saskatoon had an above normal mean temperature by 0.9°C. This was mainly due to the high minimum temperatures (2.2°C above normal). Cloudy and/or humid nights usually result in higher minimum temperatures. The mean maximum temperature was 0.4°C below normal. The warm temperatures are reflected in the below normal heating degree-days and above normal growing degree-days. Saskatoon received 78.1 hours less sunshine this June than the 1961-1990 normal. This lack of sunshine is reflected in the low global radiation and high diffuse radiation values. The cloudy days and above normal precipitation were influencing factors on the low evaporation amounts (28.8 mm below normal).

If you think it rained every day in June - you're close. Nineteen out of the 30 days had measurable precipitation, while another three days received trace amounts.

Table 8

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl
MONTHLY WEATHER SUMMARY FOR
JULY, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	18.1	17.5	18.4	
Monthly Mean Maximum Temperature[5] (°C)	24.3	23.4	25.1	
Monthly Mean Minimum Temperature[6] (°C)	11.9	11.5	11.6	
Extreme Maximum Temperature[7] (°C)	29.0	31.5	38.5	40.0
Year/Day(s)[20]	1991/13	1990/31	1984/27	1919/17&1941/19
Years of Record[21]	1	1	27	95
Extreme Minimum Temperature[7] (°C)	7.0	6.5	1.7	-0.6
Year/Day(s)[20]	1991/24	1990/20	1967/2	1918/25
Years of Record[21]	1	1	27	95
Days with Frost[8]	0	0	0	
Heating Degree-Days[9] (18°C base)	30.0	55.5	28.7	
Growing Degree-Days[10] (5°C base)	402.5	379.5	409.8	
Total Precipitation[11] (mm)	58.2	78.0	55.8	
Total Rainfall[11] (mm)	58.2	78.0	55.8	
Total Snowfall[12] (cm)	0.0	0.0	0.0	
Greatest 24-hour Precipitation (mm)	21.7	23.0	45.5	79.2
Year/Day(s)[20]	1991/4	1990/2	1968/29	1946/3
Years of Record[21]	1	1	27	95
Greatest 24-hour Rainfall (mm)	21.7	23.0	45.5	79.2
Year/Day(s)[20]	1991/4	1990/2	1968/29	1946/3
Years of Record[21]	1	1	27	95
Greatest 24-hour Snowfall (cm)	0.0	0.0	0.0	0.0
Year/Day(s)[20]	--	--	--	--
Years of Record[21]	1	1	27	95
Precipitation Days[13]	11	12	12	
Rainfall Days[13]	11	12	12	
Snowfall Days[13]	0	0	0	
Total Net Evaporation[14] (mm)	230.8	207.6	232.8	
Mean Wind Speed[15] (km/hr)	14.8	14.0	15.5	
Peak Gust Speed[16] (km/hr)	68.4	88.5	103.0	
Total Bright Sunshine[17] (hr)	359.9	293.4	333.1	
Percent Possible Bright Sunshine[18]	71.8	58.6	66.5	
Total Global Radiation[19] (MJ m^{-2})	690.2	613.9	633.5	
Total Diffuse Radiation[19] (MJ m^{-2})	200.0	226.7	216.5	
Mean Soil Temperature[22] (°C) (10,50 cm)	18.1, 17.4	17.5, 16.7	18.1, 16.8	
Mean Soil Temperature[22] (°C) (150,300 cm)	12.1, 8.2	10.8, 7.3	11.0, 7.5	

SUMMARY:

The mean temperatures and precipitation for July, 1991 were near normal. The mean monthly temperature was 0.3°C below the 1961-1990 normal. The mean maximum temperature was 0.8°C below but the mean minimum temperature was 0.3°C above normal. The extreme maximum temperature reached was 29.0°C, while the extreme minimum temperature was 7.0°C. The heating degree days were near normal, while the growing degree days were 7.3 below normal. July had 58.2 mm of precipitation, 19.8 mm below last year's amount. Since January 1, Saskatoon has received 388.3 mm of precipitation (162.7% of normal). The Saskatoon area also experienced some severe thunderstorms in July. The July 29 thunderstorm brought 11.8 mm of rain and some hail. The peak wind speed was only 68.4 km/hr. The amount of bright sunshine was 26.8 hours more than normal. This high amount of sunshine is reflected in the higher than normal global radiation and lower than normal diffuse radiation.

Did you know that by the end of June 1991, Saskatchewan had received its normal yearly total for tornadoes (at 15) and that a total of 32 severe thunderstorm warnings was issued in the May 1 to June 30 time period (Environment Canada 1991)?

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 9

MONTHLY WEATHER SUMMARY FOR
AUGUST, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	20.6	17.8	17.2	
Monthly Mean Maximum Temperature[5] (°C)	27.8	24.8	24.3	
Monthly Mean Minimum Temperature[6] (°C)	13.4	10.8	10.1	
Extreme Maximum Temperature[7] (°C)	36.0	35.0	37.0	37.8
Year/Day(s)[20]	1991/31	1990/6	1984/10	1893/6&1949/6
Years of Record[21]	1	1	27	94
Extreme Minimum Temperature[7] (°C)	8.0	5.5	-2.8	-2.8
Year/Day(s)[20]	1991/26 & 27	1990/27	1976/28	1976/28
Years of Record[21]	1	1	27	94
Days with Frost[8]	0	0	0	
Heating Degree-Days[9] (18°C base)	11.5	46.5	63.3	
Growing Degree-Days[10] (5°C base)	486.0	394.5	378.3	
Total Precipitation[11] (mm)	33.3	7.1	35.2	
Total Rainfall[11] (mm)	33.3	7.1	35.2	
Total Snowfall[12] (cm)	0.0	0.0	0.0	
Greatest 24-hour Precipitation (mm)	17.7	3.1	27.9	73.7
Year/Day(s)[20]	1991/13	1990/16	1989/25	1945/3
Years of Record[21]	1	1	27	94
Greatest 24-hour Rainfall (mm)	17.7	3.1	27.9	73.7
Year/Day(s)[20]	1991/13	1990/16	1989/25	1945/3
Years of Record[21]	1	1	27	94
Greatest 24-hour Snowfall (cm)	0.0	0.0	0.0	0.0
Year/Day(s)[20]	--	--	--	--
Years of Record[21]	1	1	27	94
Precipitation Days[13]	8	6	9	
Rainfall Days[13]	8	6	9	
Snowfall Days[13]	0	0	0	
Total Net Evaporation[14] (mm)	255.9	217.1	206.6	
Mean Wind Speed[15] (km/hr)	14.9[a]	14.8[b]	15.5	
Peak Gust Speed[16] (km/hr)	69	68	105	
Total Bright Sunshine[17] (hr)	320.6	241.2	294.8	
Percent Possible Bright Sunshine[18]	71	53	65	
Total Global Radiation[19] (MJ m^{-2})	550.6[a]	429.1[c]	529.0	
Total Diffuse Radiation[19] (MJ m^{-2})	187.2[a]	195.1[c]	185.6	
Mean Soil Temperature[22] (°C) (10,50 cm)	18.3, 18.1	17.3, 17.1	16.7, 16.8	
Mean Soil Temperature[22] (°C) (150,300 cm)	13.5, 10.0	12.3, 8.8	12.4, 9.3	

[a] 1 day missing data [b] 2 days missing data [c] 3 days missing data

SUMMARY:

August, 1991 was hot. The mean temperature was nearly 20% above normal for August - even higher than July's normal mean temperature. The mean maximum and minimum temperatures were 3.5°C and 2.6°C higher than normal. August 31 was the hottest day of the month when a temperature of 36°C was reached - this is only 1°C less than the 30 year extreme. Maximum daily temperatures were greater than 30°C for 11 days, including a six day long heat wave. The warmth of the month was reflected in the low heating degree days and high growing degree days. The amount of precipitation received was 1.9 mm below normal, although the January to August amount is still above normal (by 147.7 mm). The high temperatures also resulted in the high amount of evaporation that occurred (24% above the 1961-1990 normal). Wind speeds were well below normal. The amount of bright sunshine was 9% above normal. The total global radiation and total diffuse radiation were also above normal.

August, 1991 was the hottest month in the last 30 years (in terms of mean and mean minimum temperatures). 1981 held the previous records with mean and mean minimum temperatures of 20.5°C and 12.5°C.

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 10 **MONTHLY WEATHER SUMMARY FOR SEPTEMBER, 1991**

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	11.9	13.6	11.3	
Monthly Mean Maximum Temperature[5] (°C)	18.8	21.5	17.7	
Monthly Mean Minimum Temperature[6] (°C)	4.9	5.7	4.8	
Extreme Maximum Temperature[7] (°C)	33.0	31.0	35.6	35.6
Year/Day(s)[20]	1991/1	1990/2	1978/4	1978/4
Years of Record[21]	1	1	27	92
Extreme Minimum Temperature[7] (°C)	-3.0	-1.5	-7.8	-11.1
Year/Day(s)[20]	1991/27	1990/22	1978/30	1908/28
Years of Record[21]	1	1	27	92
Days with Frost[8]	3	4	4	
Heating Degree-Days[9] (18°C base)	204.5	142.0	199.6	
Growing Degree-Days[10] (5°C base)	199.6	254.0	196.2	
Total Precipitation[11] (mm)	20.4	6.3	32.8	
Total Rainfall[11] (mm)	20.4	6.3	31.1	
Total Snowfall[12] (cm)	0.0	0.0	1.8	
Greatest 24-hour Precipitation (mm)	8.6	4.3	29.6	44.2
Year/Day(s)[20]	1991/29	1990/8	1980/3	1931/12
Years of Record[21]	1	1	27	92
Greatest 24-hour Rainfall (mm)	8.6	4.3	29.6	44.2
Year/Day(s)[20]	1991/29	1990/8	1980/3	1931/12
Years of Record[21]	1	1	27	92
Greatest 24-hour Snowfall (cm)	0.0	0.0	17.6	17.6
Year/Day(s)[20]	--	--	1982/28	1982/28
Years of Record[21]	1	1	27	92
Precipitation Days[13]	10	5	9	
Rainfall Days[13]	10	5	9	
Snowfall Days[13]	0	0	0	
Total Net Evaporation[14] (mm)	149.2	172.4	125.8	
Mean Wind Speed[15] (km/hr)	16.5	13.4*	16.7	
Peak Gust Speed[16] (km/hr)	85	79	89	
Total Bright Sunshine[17] (hr)	186.2	241.2	188.9	
Percent Possible Bright Sunshine[18]	49	64	50	
Total Global Radiation[19] (MJ m^{-2})	354.3	421.0	351.8	
Total Diffuse Radiation[19] (MJ m^{-2})	135.8	120.8	127.6	
Mean Soil Temperature[22] (°C) (10,50 cm)	12.1, 14.8	12.9, 14.8	11.2, 13.3	
Mean Soil Temperature[22] (°C) (150,300 cm)	13.0, 10.8	11.9, 9.6	11.9, 9.9	

* Information from Saskatoon Airport

SUMMARY:

September, 1991 was a typical autumn month in Saskatchewan. The mean monthly temperature was near normal, while the precipitation was 12.4 mm below normal. September was the first month since January of this year, with precipitation amounts lower than 10 mm below normal. However, Saskatoon is still more than 144% above the normal for the amount of precipitation it has received. The harvest season was interrupted by 10 days with varying amounts of rainfall. The evaporation rate was 18% higher than normal, thus enabling harvesting to continue. The mean maximum temperature was 1.1°C higher than normal, while the mean minimum was near normal. The highest temperature (33°C) occurred on September 1. The lowest temperature (-3.0°C) occurred on the 27th, but the first frost was on the 18th. There were 4.9 more heating degree days and 3.4 more growing degree days. The peak wind speed was over 60 km/hr on 7 days. The extreme peak of 85 km/hr occurred on the 24th.

Saskatoon is one of the few areas in Saskatchewan that did not receive snow in September. North Battleford, Wapella area in southeastern Saskatchewan and Swift Current region all received scattered amounts of snow. Snow came as close to Saskatoon as Vanscoy.

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 11 **MONTHLY WEATHER SUMMARY FOR OCTOBER, 1991**

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	1.1	3.3	4.8	
Monthly Mean Maximum Temperature[5] (°C)	6.1	10.2	10.9	
Monthly Mean Minimum Temperature[6] (°C)	-4.0	-3.7	-1.3	
Extreme Maximum Temperature[7] (°C)	24.0	20.0	28.5	32.2
Year/Day(s)[20]	1991/11	1990/25 & 28	1984/8	1943/5
Years of Record[21]	1	1	27	92
Extreme Minimum Temperature[7] (°C)	-21.5	-13.0	-19.5	-25.6
Year/Day(s)[20]	1991/29 & 30	1990/17	1984/30 & 31	1919/26
Years of Record[21]	1	1	27	92
Days with Frost[8]	22	26	19	
Heating Degree-Days[9] (18°C base)	528.0	463.5	405.2	
Growing Degree-Days[10] (5°C base)	66.5	25.0	62.2	
Total Precipitation[11] (mm)	64.3	4.9	18.0	
Total Rainfall[11] (mm)	30.9	1.6	7.9	
Total Snowfall[12] (cm)	33.4	3.3	9.6	
Greatest 24-hour Precipitation (mm)	27.6	1.5	36.7	36.7
Year/Day(s)[20]	1991/21	1990/4	1984/16	1984/16
Years of Record[21]	1	1	27	92
Greatest 24-hour Rainfall (mm)	13.0	0.5	23.1	34.0
Year/Day(s)[20]	1991/21	1990/9 & 26	1969/2	1914/5
Years of Record[21]	1	1	27	92
Greatest 24-hour Snowfall (cm)	14.6	1.5	36.7	36.7
Year/Day(s)[20]	1991/21	1990/4	1984/16	1984/16
Years of Record[21]	1	1	27	92
Precipitation Days[13]	14	7	6	
Rainfall Days[13]	8	4	4	
Snowfall Days[13]	7	3	3	
Total Net Evaporation[14] (mm)	–	–	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	18.1	16.1*	17.1	
Peak Gust Speed[16] (km/hr)	80	78	96	
Total Bright Sunshine[17] (hr)	127.7	133.9	166.4	
Percent Possible Bright Sunshine[18]	39	41	51	
Total Global Radiation[19] (MJ m^{-2})	226.4	223.2	239.1	
Total Diffuse Radiation[19] (MJ m^{-2})	122.5	110.8	92.6	
Mean Soil Temperature[22] (°C) (10,50 cm)	5.1, 9.4	3.6, 8.3	4.5, 8.1	
Mean Soil Temperature[22] (°C) (150,300 cm)	10.8, 10.2	10.0, 9.4	9.7, 9.5	

* Information from Saskatoon Airport

SUMMARY:

October, 1991 was a cold month. Several low temperature records were close to being broken. The mean monthly temperature was only 0.4°C. higher than the lowest mean which occurred in 1969. The mean maximum temperature was only 1.5°C. higher than the 30 year lowest mean maximum temperature which occurred in 1969. October, 1991 had the lowest mean minimum temperature for the last 30 years. The previous record was set last year at -3.7°C. The highest temperature occurred on the 11th with a temperature of 24°C. and the lowest temperature occurred on the 29th and 30th at -21.5°C. The daily record was broken for the 30th - the previous was -21°C. There were 21 days that recorded below normal mean daily temperatures. The latter part of the month had mean temperatures similar to those of mid to end of November. The total precipitation broke the previous 30 year record of 60.9 mm (in 1984). The amount of snowfall recorded was below the previous records of 1984 (55.8 cm) and 1969 (55.8 cm) but a new record rainfall was set that was 5 mm above the previous 30 year record recorded in 1967.

October, 1991 was an extremely cold, wet and snowy month but at least we didn't get the big snowfall like the one that occurred in 1984. That snowfall stopped city buses from running and closed business places early.

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 12

MONTHLY WEATHER SUMMARY FOR
NOVEMBER, 1991

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	-8.0	-7.5	-6.1	
Monthly Mean Maximum Temperature[5] (°C)	-4.0	-2.5	-1.5	
Monthly Mean Minimum Temperature[6] (°C)	-12.0	-12.5	-10.5	
Extreme Maximum Temperature[7] (°C)	7.0	12.0	19.4	21.7
Year/Day(s)[20]	1991/12	1990/13	1975/4	1903/3
Years of Record[21]	1	1	28	93
Extreme Minimum Temperature[7] (°C)	-25.0	-28.0	-33.5	-39.4
Year/Day(s)[20]	1991/6	1990/25	1985/24	1893/30
Years of Record[21]	1	1	28	93
Days with Frost[8]	28	30	29	
Heating Degree-Days[9] (18°C base)	787.0	722.0	692	
Growing Degree-Days[10] (5°C base)	0.0	0.0	2.8	
Total Precipitation[11] (mm)	20.7	22.7	14.9	
Total Rainfall[11] (mm)	0.0	0.0	2.2	
Total Snowfall[12] (cm)	20.7	22.7	13.2	
Greatest 24-hour Precipitation (mm)	11.6	11.4	19.3	27.9
Year/Day(s)[20]	1991/25	1990/20	1978/4	1938/1
Years of Record[21]	1	1	28	93
Greatest 24-hour Rainfall (mm)	0.0	0.0	14.5	14.5
Year/Day(s)[20]	--	--	1978/4	1978/4
Years of Record[21]	1	1	28	93
Greatest 24-hour Snowfall (cm)	11.6	11.4	17.5	27.9
Year/Day(s)[20]	1991/25	1990/20	1982/6	1938/1
Years of Record[21]	1	1	28	93
Precipitation Days[13]	6	6	8	
Rainfall Days[13]	0	0	1	
Snowfall Days[13]	6	6	7	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	16.6	16.7	15.3	
Peak Gust Speed[16] (km/hr)	70.9	71.5	100.0	
Total Bright Sunshine[17] (hr)	80.1	99.3	101.8	
Percent Possible Bright Sunshine[18]	30	38	39	
Total Global Radiation[19] (MJ m^{-2})	129.6	113.2	123.7	
Total Diffuse Radiation[19] (MJ m^{-2})	84.3	79.4	73.6	
Mean Soil Temperature[22] (°C) (10,50 cm)	-1.0, 3.6	-2.0, 3.3	-1.7, 2.6	
Mean Soil Temperature[22] (°C) (150,300 cm)	7.3, 8.8	7.2, 8.2	6.8, 8.1	

SUMMARY:

November, 1991 was cool and moderately snowy, although people may have felt it was warmer because the end of October was so cold. November did continue where October ended - cold. On the 5th (-23.0°C) a new extreme minimum temperature was recorded, while the 6th equalled a previous extreme low (-25°C). But by the 12th the temperature had risen to 7°C (the extreme maximum for the month). The monthly mean temperature was 1.9°C below normal. The mean maximum and the mean minimum were below normal by 2.5°C and 1.5°C respectively. The coolness of the month is reflected in the high number of heating degree days (95 above the 1961-1990 normal). November had an above normal precipitation amount - by 5.8 mm. This station is now just 4.4 mm below the all time precipitation record that was set in 1942 when 531.4 mm of precipitation was recorded. The mean wind speed was 1.3 km/hr above normal while the peak wind speed was only 70.9 km/hr. November was a cloudy month with only 30% of the total possible sunshine hours being recorded. The soil temperatures were all above normal; in fact, the soil did not stay continuously frozen, at the 10 cm level, until the 20th.

November had only trace amounts of rainfall but there was enough liquid water in the atmosphere to create a rainbow near Vanscoy (Wilkinson *p. comm.*).

SASKATOON
SASKATCHEWAN RESEARCH COUNCIL
CLIMATE REFERENCE STATION
LOCATION: 52°09'n 106° 36'w 497 M msl

Table 13 **MONTHLY WEATHER SUMMARY FOR DECEMBER, 1991**

Element	1991 Value	1990 Value	Mean or Extreme Value 1961 - 1990	Extreme All Years
Monthly Mean Temperature[4] (°C)	-11.0	-18.2	-14.8	
Monthly Mean Maximum Temperature[5] (°C)	-6.7	-12.7	-9.8	
Monthly Mean Minimum Temperature[6] (°C)	-15.2	-23.7	-19.3	
Extreme Maximum Temperature[7] (°C)	4.5	5.5	9.5	13.3
Year/Day(s)[20]	1991/21	1990/8	1987/7	1939/5
Years of Record[21]	1	1	28	93
Extreme Minimum Temperature[7] (°C)	-39.0	-30.5	-42.2	-43.9
Year/Day(s)[20]	1991/3	1990/21	1973/31	1892/22
Years of Record[21]	1	1	28	93
Days with Frost[8]	31	31	31	
Heating Degree-Days[9] (18°C base)	902.0	1117.0	987.7	
Growing Degree-Days[10] (5°C base)	0.0	0.0	0.0	
Total Precipitation[11] (mm)	19.9	17.9	20.6	
Total Rainfall[11] (mm)	0.0	0.0	0.9	
Total Snowfall[12] (cm)	19.9	17.9	20.5	
Greatest 24-hour Precipitation (mm)	5.5	3.4	14.5	20.6
Year/Day(s)[20]	1991/4 & 5	1990/11	1973/23	1936/24
Years of Record[21]	1	1	28	92
Greatest 24-hour Rainfall (mm)	0.0	0.0	8.0	8.0
Year/Day(s)[20]	--	--	1989/3	1989/3
Years of Record[21]	1	1	28	93
Greatest 24-hour Snowfall (cm)	5.5	3.4	14.5	20.6
Year/Day(s)[20]	1991/4 & 5	1990/11	1973/23	1936/24
Years of Record[21]	1	1	28	92
Precipitation Days[13]	10	12	13	
Rainfall Days[13]	0	0	1	
Snowfall Days[13]	10	12	12	
Total Net Evaporation[14] (mm)	--	--	(May-Sept.)	
Mean Wind Speed[15] (km/hr)	16	16	15.7	
Peak Gust Speed[16] (km/hr)	66.5	77	97.0	
Total Bright Sunshine[17] (hr)	94.0	98.8	84.2	
Percent Possible Bright Sunshine[18]	39.0	41	35	
Total Global Radiation[19] (MJ m^{-2})	93.3	100.3	95.2	
Total Diffuse Radiation[19] (MJ m^{-2})	62.1	55.5	54.3	
Mean Soil Temperature[22] (°C) (10,50 cm)	-3.9, 0.4	-7.9, -1.2	-6.6, -1.7	
Mean Soil Temperature[22] (°C) (150,300 cm)	5.1, 7.0	4.4, 6.5	3.9, 6.3	

SUMMARY:

December, 1991 was mild. It has not been this mild since 1988's mean temperature of -11.0°C. The mildest December in the last 30 years was in 1974 when a mean monthly temperature of -6.9°C was recorded. The extreme maximum temperature for December 1991 was 5°C below the 30 year extreme value while the extreme minimum temperature was 11.7°C above the extreme 30 year value. December's warmth was reflected in the low number of heating degree-days (215 less than the December 1990 number). Saskatoon received less precipitation than normal (0.7 mm) but over the last 3 months Saskatoon has received 104.0 mm of precipitation, 74.0 cm of which was snow. This much precipitation in the last quarter of a year has not been recorded since 1969 (with 108.0 mm of precipitation of which 83.0 cm was snowfall). The soil temperatures remained well above normal. The 10 cm level is 2.7°C above normal and 4.0°C above last years value.

The beginning of December had below normal temperatures, but it warmed up for the Christmas season so that all the outdoor winter activities such as skating, tobogganing and even snowman building could be enjoyed to the utmost.

Table 14 Soil Temperature and Snow Cover at Saskatoon SRC, January 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	-11.4	12.0	31	1	10
10	-11.1	11.0	31	5	10
20	-9.4	9.5	31	10	10
50	-5.4	4.0	31	15	11
100	-1.0	1.5	31	20	10
150	1.4	2.0	0	25	10
300	4.5	2.0	0	31	14

Table 15 Soil Temperature and Snow Cover at Saskatoon SRC, February 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	-4.3	5.0	28	1	13
10	-3.9	5.5	28	5	4
20	-2.9	4.5	28	10	9
50	-1.7	2.5	28	15	8
100	-0.4	1.0	28	20	9
150	1.0	0.5	0	25	11
300	2.9	0.5	0	28	11

Table 16 Soil Temperature and Snow Cover at Saskatoon SRC, March 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	-3.3	8.5	27	1	9
10	-2.9	8.5	20	5	11
20	-1.7	8.0	18	10	12
50	-1.0	4.0	19	15	5
100	-0.1	1.0	24	20	0
150	1.1	0.5	0	25	0
300	2.7	0.5	0	31	0

* at 0900 h

Table 17 Soil Temperature and Snow Cover at Saskatoon SRC, April 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	5.4	7.0	0	1	0
10	5.9	7.0	0	5	0
20	7.4	7.0	0	10	0
50	5.8	7.0	0	15	0
100	3.7	5.0	0	20	0
150	3.1	3.0	0	25	0
300	2.8	1.0	0	30	0

Table 18 Soil Temperature and Snow Cover at Saskatoon SRC, May 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	10.1	12.0	0	1	0
10	10.6	11.5	0	5	0
20	12.0	11.0	0	10	0
50	9.7	7.0	0	15	0
100	7.0	5.0	0	20	0
150	5.8	3.5	0	25	0
300	4.0	1.5	0	31	0

Table 19 Soil Temperature and Snow Cover at Saskatoon SRC, June 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	15.5	3.0	0	1	0
10	15.9	3.0	0	5	0
20	17.2	2.5	0	10	0
50	14.7	3.0	0	15	0
100	11.3	3.0	0	20	0
150	9.5	2.5	0	25	0
300	6.1	2.0	0	30	0

* at 0900 h

Table 20 Soil Temperature and Snow Cover at Saskatoon SRC, July 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	17.6	5.5	0	1	0
10	18.1	5.0	0	5	0
20	19.8	4.0	0	10	0
50	17.4	2.5	0	15	0
100	14.0	2.5	0	20	0
150	12.1	2.0	0	25	0
300	8.2	2.0	0	31	0

Table 21 Soil Temperature and Snow Cover at Saskatoon SRC, August 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	18.0	5.5	0	1	0
10	18.3	5.0	0	5	0
20	20.1	4.0	0	10	0
50	18.1	1.5	0	15	0
100	15.0	1.0	0	20	0
150	13.5	1.0	0	25	0
300	10.0	1.5	0	31	0

Table 22 Soil Temperature and Snow Cover at Saskatoon SRC, September 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	11.8	13.0	0	1	0
10	12.2	12.0	0	5	0
20	14.5	10.0	0	10	0
50	14.8	5.0	0	15	0
100	13.5	3.0	0	20	0
150	13.0	1.5	0	25	0
300	10.8	0.5	0	30	0

* at 0900 h

Table 23 Soil Temperature and Snow Cover at Saskatoon SRC, October 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	4.7	10.0	0	1	0
10	5.1	10.0	0	5	0
20	7.2	10.5	0	10	0
50	9.4	7.0	0	15	0
100	10.1	4.0	0	20	0
150	10.8	3.0	0	25	21
300	10.2	1.0	0	31	20

Table 24 Soil Temperature and Snow Cover at Saskatoon SRC, November 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	-1.6	6.0	30	1	20
10	-1.0	6.5	23	5	20
20	0.2	5.5	10	10	19
50	3.6	4.0	0	15	19
100	6.1	3.0	0	20	13
150	7.3	2.5	0	25	12
300	8.8	1.5	0	30	17

Table 25 Soil Temperature and Snow Cover at Saskatoon SRC, December 1991*

Depth (cm)	Mean Temp. (°C)	Range (°C)	Frost Days	Date	Snow Depth (cm)
5	-4.1	3.5	31	1	16
10	-3.9	3.5	31	5	20
20	-2.5	3.0	31	10	19
50	0.4	2.0	1	15	22
100	3.4	1.5	0	20	18
150	5.1	1.5	0	25	19
300	7.0	2.0	0	31	18

* at 0900 h

Table 26 Diffuse Solar Radiation (MJ m^{-2}) at Saskatoon SRC, 1991[a]

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	1.4	3.2	1.0	4.7	7.9	5.7	5.7	9.6	7.1	4.7	4.3	2.5
2	1.1	4.1	4.9	5.0	8.8	7.7	10.4	11.4	8.0	5.2	5.4	3.0
3	2.2	2.9	5.9	7.0	8.4	7.5	5.4	5.8	3.6	5.8	4.7	2.9
4	2.3	1.6	4.0	5.0	7.3	9.5	5.3	5.6	4.4	4.9	3.1*	1.7
5	1.6	3.7	2.3	3.8	3.9	6.0	6.8	5.2	8.0	4.4	2.4	2.4
6	1.4	3.6	2.9	6.4	5.9	11.1	7.9	8.6	5.1	2.3	2.7	2.6
7	1.6	4.1	8.4	4.6	10.7	10.4	5.7	10.5	3.7	3.0	2.2	1.6
8	1.6	1.6	6.4	5.3	8.3	7.1	7.7	5.5	3.3	2.3	4.1	2.3
9	1.4	1.8	3.6	4.5	6.1	6.8	4.5	4.6	5.2	4.2	3.4	1.9*
10	1.6	3.8*	6.9	7.8	4.9	5.6	10.5	6.2	5.3	3.9	3.6	1.7
11	1.8	1.8	7.9	9.6	4.0	7.6	9.9	7.7	4.7	2.3	2.5	2.6
12	2.1	2.6*	8.5	2.5	7.4	8.1	6.0	4.1	3.8	4.8	2.7	2.2
13	2.4*	4.8	4.7	4.8	9.0	4.1	5.1	7.4	5.9	4.5	1.3*	2.0
14	1.0*	4.2	3.1	5.5	8.2	8.4	5.8	8.9	4.3	3.9	2.3	2.0
15	2.1	5.1*	2.7	7.6	11.5	10.4	4.6	6.2	6.2	4.5	2.2	1.9*
16	2.3	4.1*	3.2	8.5	5.5	6.6	4.9	6.8	7.0	2.4*	2.9	1.7
17	2.3	3.6*	4.6	5.9	9.5	11.1	8.5	3.8	6.6	4.8	2.1*	2.0
18	1.7*	4.5	3.6	4.5	4.9	8.8	5.5	5.2	3.0	2.4	2.0	2.0
19	2.8	3.4	2.6	3.6	M	7.1	8.1	5.7	3.1	4.1	2.5	1.8
20	2.6	3.2	2.5	5.8	M	12.8	8.7	5.2	3.1	1.7	2.5	1.6
21	2.8	5.6	1.7	6.7	M	11.7	10.2	4.8	2.1	1.1	3.3	2.1*
22	2.9	6.3*	6.5	5.2	5.6	6.3	5.3	5.5	2.5	5.9	2.1	1.8
23	2.9	6.0*	5.3	4.5	8.9	7.7	6.1	8.0	3.3	5.7	2.5	2.4
24	3.2	5.3	5.8	5.6	8.8	9.4	3.8	M	1.4	4.3	3.1	1.6
25	2.9	4.6	8.1	10.9	11.0	11.3	4.5	7.6	5.3	2.6*	1.8	1.5
26	3.6	6.6	10.2*	2.0	10.1	4.5	5.0	5.2	2.1	5.0	2.1*	1.7
27	3.1	6.0*	6.8	0.9	3.3	10.9	7.1	3.7	3.7	3.9	2.9	1.5
28	4.9	4.1	8.1	4.7	10.4	13.0	6.6	5.0	2.7	5.3	2.2*	1.6
29	3.4*		5.2	4.7*	9.4	7.1	6.3	4.8	4.7	4.0	2.9	2.0
30	2.6		2.9	10.1	5.3	4.3	4.3	3.2	6.6	3.9	2.5	1.4
31	4.2		5.1		6.4		3.8	5.4		4.7		2.1
TOTAL	73.8	112.2	155.4	167.7	211.4	248.6	200.0	187.2	135.8	122.5	84.3	62.1

M means missing data

* instrumentation problem possible

[a] converted from integrated tape values (MV)

Table 27 Global Solar Radiation (MJ m^{-2}) at Saskatoon SRC, 1991[a]

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	5.2	5.5	13.4	16.9	8.2	26.0	6.1	10.7	11.2	11.0	6.3	2.5
2	4.3	4.9	7.8	15.8	21.8	24.4	22.1	16.8	17.6	9.5	5.5	3.7
3	4.9	6.6	7.9	8.7	22.0	14.5	25.5	21.2	17.8	8.6	6.5	3.2
4	2.3	7.4	6.0	17.1	23.3	10.6	24.3	22.6	5.2	7.3	3.1	1.8
5	4.6	5.3	13.8	15.8	25.9	6.2	25.5	23.3	15.5	9.6	7.5	2.6
6	5.5	6.9	13.5	16.2	24.3	14.2	8.5	16.1	16.4	12.5	8.2	2.7
7	4.6	5.0	8.7	5.1	18.8	14.7	26.9	14.3	17.1	10.2	7.0	1.6
8	5.5	4.6	11.8	17.3	15.4	21.4	22.9	20.9	3.4	11.9	4.5	2.1
9	5.5	8.3	14.5	18.0	12.2	25.6	26.9	23.2	9.8	6.6	4.9	1.9
10	5.2	3.8	11.9	13.1	24.9	23.3	16.4	23.0	9.1	9.0	5.1	3.6
11	6.1	7.4	12.0	13.2	25.8	19.7	15.0	23.1	15.5	11.0	6.0	3.7
12	4.3	2.6	12.4	21.3	8.5	22.2	25.4	23.0	15.1	9.6	4.6	3.9
13	2.4	6.8	14.3	19.8	10.9	28.0	26.1	18.5	13.5	6.8	1.3	3.1
14	1.0	8.9	14.6	6.4	9.5	24.5	24.1	13.5	4.6	4.5	6.2	4.3
15	3.6	5.1	15.3	8.3	17.7	19.8	25.4	7.2	13.8	7.1	6.7	1.9
16	2.3	4.1	15.6	9.5	24.9	24.3	25.0	19.1	8.7	2.4	4.7	3.6
17	5.2	3.6	12.9	20.1	18.1	17.3	19.2	21.9	7.5	7.9	2.1	4.3
18	1.7	6.6	15.0	22.1	26.6	17.6	24.6	20.6	16.2	10.8	4.9	3.1
19	2.8	6.8	15.8	22.2	M	25.6	23.9	20.4	16.4	6.1	4.1	2.2
20	6.2	8.0	15.8	21.8	M	21.7	23.6	14.6	15.0	1.7	3.2	3.5
21	2.8	7.1	1.7	20.6	M	14.3	18.4	20.1	M	1.1	3.3	2.1
22	2.9	6.3	13.1	21.0	25.2	6.6	25.4	16.2	12.5	6.0	2.1	3.2
23	6.2	6.0	5.3	22.2	22.4	19.2	24.6	18.0	11.6	5.7	3.0	3.0
24	3.2	10.5	13.8	19.2	21.7	21.3	24.6	M	12.9	4.7	3.2	3.1
25	3.1	10.2	12.6	17.0	17.7	13.6	25.6	16.3	10.3	2.6	1.8	3.5
26	3.7	10.3	10.2	2.3	14.4	4.7	22.4	17.8	14.8	5.4	2.1	3.5
27	3.1	6.0	10.4	1.1	27.9	25.2	21.4	19.7	13.6	3.9	3.9	3.6
28	5.9	11.2	13.6	4.7	12.1	17.0	20.2	13.3	13.9	8.5	2.2	3.3
29	3.4		15.0	4.7	16.7	10.5	19.7	17.4	7.4	9.0	3.1	5.1
30	6.5		18.0	13.7	27.4	4.7	25.0	19.6	7.9	9.0	2.5	1.5
31	5.1		16.9		25.0		25.5	18.2		6.4		2.1
TOTAL	129.1	185.8	383.6	435.2	549.3	538.7	690.2	550.6	354.3	226.4	129.6	93.3

M means missing data

[a] converted from integrated tape values (MV)

Table 28 Some Significant Climatic Events, 1991

FROST FREE SEASON

Last Spring Frost	First Fall Frost	Length of Season
1991 May 27	September 18	113
1990 May 13	September 22	130
Normal May 19 (1961-1990)	September 15	119

SNOW SEASON

Greatest Depth of Snow on Ground (cm)

	Jan.	Feb.	Mar.	Apr.	Oct.	Nov.	Dec.
1991	14	13	12	0	23	24	22
1990	18	15	10	5	0	9	17

	Cessation[1] of Snow Pack	Last Spring Snowfall	First Fall Snow	Onset[2] of Snow Pack
1991	March 19	May 1	Oct. 16	Oct. 22
1990	March 8	April 29	Oct. 4	Nov. 1

WEATHER "SPELLS"[3,4,5,6]

	1991		1990	
Longest Cool Spell	18 days	Oct. 21 - Nov. 7	16 days	May 7 - May 22
Longest Cold Spell	5 days	Jan. 5 - Jan. 9	4 days	Jan. 29 - Feb. 1
				Dec. 19 - Dec. 22
				Dec. 28 - Dec. 31
Longest Warm Spell	18 days	Mar. 27 - Apr. 13	24 days	Feb. 25 - Mar. 20
Longest Hot Spell	6 days	Aug. 8 - Aug. 13	3 days	Aug. 5 - Aug. 7
Longest Dry Spell	16 days	Dec. 14 - Dec. 29	16 days	July 28 - Aug. 12
Longest Wet Spell	6 days	June 2 - June 7	5 days	June 1 - June 5
		June 21 - June 26		
		June 28 - July 3		

1 First day on the first interval of at least 5 days duration in which snow cover is reduced to less than 1 cm depth.
2 First day on the first interval of at least 5 days duration in which snow cover equals or exceeds 1 cm depth.
3 Temperature "spells" are defined as a sequence of days when the daily mean temperature during the year in question is higher (warm spell) or lower (cool spell) than the long-term daily mean for the date in question.
4 Precipitation "spells" are defined as the sequence of days with precipitation amounts greater than trace (wet spells) or precipitation amounts of trace or less (dry spells).
5 A cold spell refers to the number of consecutive days with minimum temperatures less than or equal to -30°C.
6 A hot spell refers to the number of consecutive days with maximum temperatures equal to or greater than 30°C.

Table 29 Times of Sunrise at Saskatoon, 1991 (local time, in hours and minutes).

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.16	8.48	7.54	6.43	5.38	4.52	4.50	5.27	6.17	7.06	8.00	8.52
2	9.15	8.47	7.52	6.41	5.36	4.52	4.50	5.28	6.18	7.08	8.02	8.53
3	9.15	8.45	7.50	6.39	5.34	4.51	4.51	5.30	6.20	7.09	8.04	8.54
4	9.15	8.44	7.48	6.36	5.32	4.50	4.52	5.31	6.22	7.11	8.06	8.56
5	9.15	8.42	7.46	6.34	5.30	4.49	4.53	5.33	6.23	7.13	8.07	8.57
6	9.14	8.40	7.43	6.32	5.29	4.49	4.53	5.34	6.25	7.14	8.09	8.58
7	9.14	8.38	7.41	6.29	5.27	4.48	4.54	5.36	6.26	7.16	8.11	9.00
8	9.14	8.37	7.39	6.27	5.25	4.48	4.55	5.38	6.28	7.18	8.13	9.01
9	9.13	8.35	7.37	6.25	5.23	4.47	4.56	5.39	6.30	7.20	8.15	9.02
10	9.13	8.33	7.34	6.23	5.21	4.47	4.57	5.41	6.31	7.21	8.16	9.03
11	9.12	8.31	7.32	6.20	5.20	4.46	4.58	5.42	6.33	7.23	8.18	9.04
12	9.11	8.29	7.30	6.18	5.18	4.46	4.59	5.44	6.35	7.25	8.20	9.05
13	9.11	8.27	7.27	6.16	5.16	4.46	5.01	5.46	6.36	7.26	8.22	9.06
14	9.10	8.26	7.25	6.14	5.15	4.45	5.02	5.47	6.38	7.28	8.24	9.07
15	9.09	8.24	7.23	6.11	5.13	4.45	5.03	5.49	6.40	7.30	8.25	9.08
16	9.08	8.22	7.20	6.09	5.12	4.45	5.04	5.50	6.41	7.32	8.27	9.09
17	9.07	8.20	7.18	6.07	5.10	4.45	5.05	5.52	6.43	7.33	8.29	9.10
18	9.06	8.18	7.16	6.05	5.09	4.45	5.07	5.54	6.45	7.35	8.31	9.11
19	9.05	8.16	7.14	6.03	5.07	4.45	5.08	5.55	6.46	7.37	8.32	9.11
20	9.04	8.14	7.11	6.01	5.06	4.45	5.09	5.57	6.48	7.39	8.34	9.12
21	9.03	8.12	7.09	5.58	5.05	4.45	5.11	5.59	6.49	7.40	8.36	9.13
22	9.02	8.09	7.07	5.56	5.03	4.46	5.12	6.00	6.51	7.42	8.37	9.13
23	9.01	8.07	7.04	5.54	5.02	4.46	5.13	6.02	6.53	7.44	8.39	9.14
24	9.00	8.05	7.02	5.52	5.01	4.46	5.15	6.04	6.54	7.46	8.41	9.14
25	8.58	8.03	7.00	5.50	5.00	4.46	5.16	6.05	6.56	7.48	8.42	9.14
26	8.57	8.01	6.57	5.48	4.58	4.47	5.18	6.07	6.58	7.49	8.44	9.15
27	8.56	7.59	6.55	5.46	4.57	4.47	5.19	6.08	6.59	7.51	8.46	9.15
28	8.54	7.57	6.53	5.44	4.56	4.48	5.20	6.10	7.01	7.53	8.47	9.15
29	8.53	0.00	6.50	5.42	4.55	4.48	5.22	6.12	7.03	7.55	8.49	9.15
30	8.51	0.00	6.48	5.40	4.54	4.49	5.23	6.13	7.04	7.57	8.50	9.16
31	8.50	0.00	6.46	0.00	4.53	0.00	5.25	6.15	0.00	7.58	0.00	9.16

Table 30 Times of Sunset at Saskatoon, 1991 (local time, in hours and minutes).

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	17.04	17.52	18.44	19.38	20.30	21.16	21.31	20.59	19.57	18.47	17.40	16.59
2	17.05	17.54	18.46	19.40	20.31	21.17	21.31	20.58	19.55	18.45	17.38	16.58
3	17.06	17.55	18.47	19.42	20.33	21.18	21.30	20.56	19.52	18.42	17.36	16.58
4	17.07	17.57	18.49	19.43	20.35	21.19	21.30	20.54	19.50	18.40	17.35	16.57
5	17.08	17.59	18.51	19.45	20.36	21.20	21.29	20.53	19.48	18.38	17.33	16.56
6	17.10	18.01	18.53	19.47	20.38	21.21	21.29	20.51	19.46	18.35	17.31	16.56
7	17.11	18.03	18.55	19.49	20.40	21.22	21.28	20.49	19.43	18.33	17.29	16.56
8	17.12	18.05	18.56	19.50	20.41	21.23	21.28	20.47	19.41	18.31	17.28	16.55
9	17.13	18.07	18.58	19.52	20.43	21.24	21.27	20.45	19.39	18.29	17.26	16.55
10	17.15	18.09	19.00	19.54	20.45	21.25	21.26	20.43	19.36	18.26	17.24	16.55
11	17.16	18.10	19.02	19.55	20.46	21.26	21.25	20.41	19.34	18.24	17.23	16.54
12	17.18	18.12	19.03	19.57	20.48	21.26	21.25	20.40	19.32	18.22	17.21	16.54
13	17.19	18.14	19.05	19.59	20.49	21.27	21.24	20.38	19.29	18.20	17.20	16.54
14	17.21	18.16	19.07	20.01	20.51	21.28	21.23	20.36	19.27	18.17	17.18	16.54
15	17.22	18.18	19.09	20.02	20.52	21.28	21.22	20.34	19.25	18.15	17.17	16.54
16	17.24	18.20	19.10	20.04	20.54	21.29	21.21	20.32	19.22	18.13	17.15	16.54
17	17.25	18.22	19.12	20.06	20.56	21.29	21.20	20.30	19.20	18.11	17.14	16.55
18	17.27	18.23	19.14	20.07	20.57	21.30	21.19	20.27	19.18	18.09	17.12	16.55
19	17.29	18.25	19.16	20.09	20.59	21.30	21.18	20.25	19.15	18.06	17.11	16.55
20	17.30	18.27	19.17	20.11	21.00	21.31	21.17	20.23	19.13	18.04	17.10	16.55
21	17.32	18.29	19.19	20.13	21.02	21.31	21.15	20.21	19.10	18.02	17.09	16.56
22	17.34	18.31	19.21	20.14	21.03	21.31	21.14	20.19	19.08	18.00	17.07	16.56
23	17.36	18.33	19.23	20.16	21.04	21.31	21.13	20.17	19.06	17.58	17.06	16.57
24	17.37	18.35	19.24	20.18	21.06	21.31	21.11	20.15	19.03	17.56	17.05	16.57
25	17.39	18.36	19.26	20.19	21.07	21.31	21.10	20.13	19.01	17.54	17.04	16.58
26	17.41	18.38	19.28	20.21	21.09	21.32	21.09	20.10	18.59	17.52	17.03	16.59
27	17.43	18.40	19.30	20.23	21.10	21.31	21.07	20.08	18.56	17.50	17.02	16.59
28	17.44	18.42	19.31	20.24	21.11	21.31	21.06	20.06	18.54	17.48	17.01	17.00
29	17.46	0.00	19.33	20.26	21.12	21.31	21.04	20.04	18.52	17.46	17.00	17.01
30	17.48	0.00	19.35	20.28	21.14	21.31	21.03	20.02	18.49	17.44	17.00	17.02
31	17.50	0.00	19.36	0.00	21.15	0.00	21.01	19.59	0.00	17.42	0.00	17.03

Figure 1. Year 1991 Daily Temperature and Cumulative Precipitation

In order to present the maximum length of climatic record for the Saskatoon area, data from several sources have been pooled to produce the historic record shown in this figure. For data sources please refer to Footnotes for Climatic Tables, note 3. The seasons shown are defined on an astronomical basis.

YEAR 1991

DAILY TEMPERATURE AND ACCUMULATIVE PRECIPITATION

SASKATOON SRC (52°09'N, 106°36'W, 497m MSL)

WINTER | SPRING | AUTUMN

TEMPERATURE (°C)

ACCUMULATIVE PRECIPITATION (MM)

LEGEND

TEMPERATURE

- EXTREME MAXIMUM TEMPERATURE - PERIOD 1892-1990
- MEAN DAILY MAXIMUM TEMPERATURE - PERIOD 1916-1975
- MEAN DAILY TEMPERATURE FOR THE PERIOD 1892-1970
- MEAN DAILY MINIMUM TEMPERATURE - PERIOD 1916-1975
- EXTREME MINIMUM TEMPERATURE - PERIOD 1892-1990
- DAILY TEMPERATURE FOR CURRENT YEAR

PRECIPITATION

- ALL TIME RECORD MAXIMUM YEARLY TOTAL PRECIPITATION - YEAR 1942
- NORMAL YEARLY TOTAL PRECIPITATION FOR PERIOD 1902 - 1974
- ALL TIME RECORD MINIMUM YEARLY TOTAL PRECIPITATION - YEAR 1961 (U of S Phy.)
- CURRENT TOTAL PRECIPITATION

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

REFERENCES

Environment Canada. 1991. Severe Weather Watch, "Watcher" Newsletter.

Klein, G. 1992. "Hike sought in water, sewer rates". The Star Phoenix. Saskatoon, Saskatchewan, January 4, 1992:1.

Phillips, D.W. 1987. Canadian Weather Trivia Calendar 1988. Canadian Government Publishing Centre. Ottawa, Ontario.

Phillips, D.W. 1986. Canadian Weather Trivia Calendar 1987. Canadian Government Publishing Centre. Ottawa, Ontario.

Wilkinson, Y. 1991. Personal Communication.

Saskatchewan Research Council
15 Innovation Blvd.
Saskatoon, Saskatchewan
Canada
S7N 2X8